Supplementary Online Content

Chang DW, Neville TH, Parrish J, et al. Evaluation of time-limited trials among critically ill patients with advanced medical illnesses and reduction of nonbeneficial ICU treatments. *JAMA Intern Med*. Published online April 12, 2021. doi:10.1001/jamainternmed.2021.1000

This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Time-Limited Trial Conversation Guide

We designed this protocol as a guide to use during family meetings for patients at risk for receiving non-beneficial ICU treatments. Think of the steps as signposts—you might find that certain things do not apply to your patient and meeting.

Family Meeting Steps	Sample Phrases
1. Introduce everyone and the agenda for meeting	• Let's start with introductions. My name is [A] and my role is [B]. • The purpose of this meeting is to talk about [C, D, E…]. • Is there anything that you would like to cover in addition?
2. Explain what is happening	• Tell me what you understand of [patient]'s condition and the medical care he/she has received in the ICU. • From our standpoint, here are the most important pieces of information so far [summarize ICU course and key findings].
3. Define acute care needs and prognosis	• The most important treatments that [patient] is receiving are [summarize]. • Based on the information we have so far, our hope is he/she improves with these treatments. However, I am concerned that he/she may not. I believe that the likelihood that he/she responds to treatment is [prognosis and most likely outcomes of ICU care] ***If prognosis is grim, explain why and offer opportunity for questions…*** • I understand that this news (or prognosis) is difficult to hear. The reason we believe that the prognosis is poor is [explanation]. • I would like to pause here and give you the opportunity to ask questions before we continue.
4. Empathize with each person, dignify emotions	• I can see that you are concerned about [A] • We are impressed and grateful that you are here to support [patient].
5. Highlight the patient's voice and elicit his/her values and preferences	• Given his/her current condition, if [patient] could speak, what do you think he/she would say about this? • What would [patient] say about what he/she would like to avoid? • In terms of quality of life, what are the most important things to him/her? • Would [patient] be okay with the most likely outcome of this ICU care? • Would [patient] be okay with undergoing these invasive treatments? ***If patient would forgo ICU treatments, recommend transition to comfort-focused care.*** ***If patient would continue ICU treatments, continue to next step.***
6. Plan a time limited trial together	• It sounds like [patient] would be okay with ICU treatments right now, but if it looked like they were not helping perhaps it would be different story. • I would like to make a recommendation…

	• Let's see how [patient] responds to these ICU treatments. Although some of these treatments may be cause some discomfort, it would give us the best opportunity to see how [patient] responds to them. • The following information should help us decide whether there is improvement or not [define markers of improvement/worsening]. • If [patient] improves we should continue aggressive care and see how much overall improvement there will be. • However, if [patient]'s condition worsens, we need to consider the possibility that ICU treatments he/she is receiving may not be able to achieve our goals of care • Our concern in such a situation would be that [patient] would be at risk for suffering through uncomfortable, invasive treatments without benefit. • In such circumstances, most patients and family members chose to change the goals of the ICU care towards focusing on comfort, recognizing that invasive treatments are unlikely to reverse the illness. • Of course, it is our hope that [patient] improves, but we mention these potential scenarios to emphasize that we should hope for the best, but also prepare for the worst.
7. Allow reflection, questions and concerns	• I'd like to hear everyone's thoughts about the plan
8. Set a timeline to meet again	• Based on our plan, I would like to suggest that we meet again in [X] to discuss how [patient] is doing. • If there are any urgent changes in his/her condition, we will notify you immediately.
9. Conclude meeting	• Thank you for taking the time to meet with us. • It is encouraging for us to see that [patient] has your support. • We look forward to speaking with you soon.

*Family Meeting format adapted from VitalTalk (vitaltalk.org)

eTable 2. Study Timeline

	Month																															
RESEARCH COMPONENTS	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
Harbor-UCLA Medical Center																																
Collect pre-intervention data on ICU patients	X	X	X	X																												
Provider education and training of TLT protocol					X	X																										
Implement multi-component TLT intervention							X	X	X	X																						
Collect post-intervention data							X	X	X	X																						
Feedback sessions with ICU teams						X	X	X	X	X																						
Olive View Medical Center																																
Collect pre-intervention data on ICU patients											X	X	X	X																		
Provider education and training of TLT protocol															X	X																
Implement multi-component TLT intervention																	X	X	X	X												
Collect post-intervention data																	X	X	X	X												
Feedback sessions with ICU teams																X	X	X	X	X												
LAC-USC Medical Center																																
Collect pre-intervention data on ICU patients																					X	X	X	X								
Provider education and training of TLT protocol																									X	X						
Implement multi-component TLT intervention																											X	X	X	X		
Collect post-intervention data																											X	X	X	X		
Feedback sessions with ICU teams																										X	X	X	X	X		
Research Team Meetings	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

eTable 3. Study Outcomes by Hospital

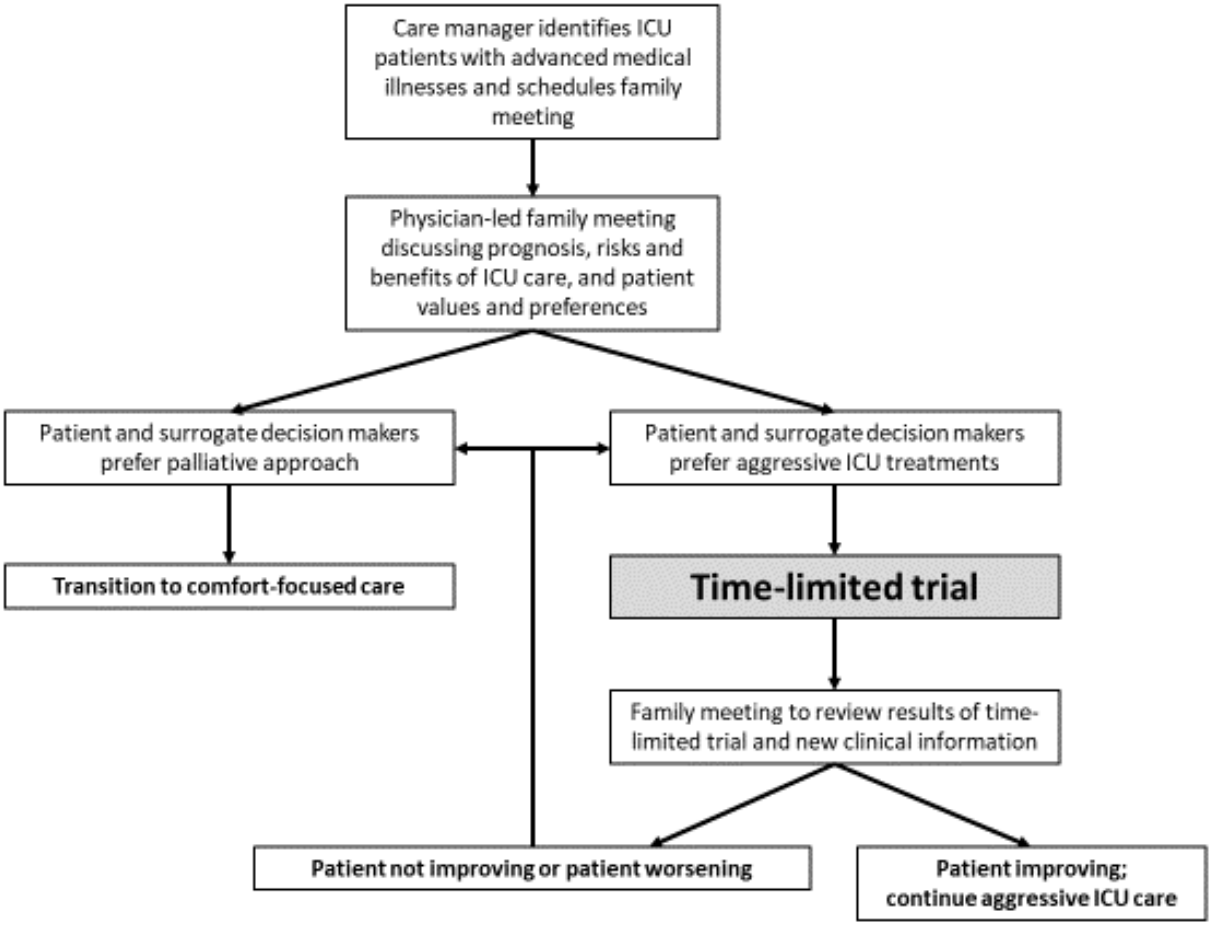
	Harbor-UCLA		Olive View		LAC-USC	
Variable	Pre-Intervention (N=44)	Post-Intervention (N=41)	Pre-Intervention (N=29)	Post-Intervention (N=15)	Pre-Intervention (N=40)	Post-Intervention (N=40)
ICU length of stay (median days, IQR)	7.2 (4.9-13.8)	5.3 (4.1-7.4)	10.1 (6.7-15.9)	6.0 (4.0-12.0)	14.1 (5.8-30.1)	10.0 (6.9-15.0)
Hospital length of stay (median days, IQR)	10.0 (5.7-20.0)	7.4 (5.0-12.5)	15.4 (10.4-28.2)	10.0 (3.8-20.3)	15.6 (8.4-30.4)	12.6 (8.4-20.3)
Family Meetings (%)	22 (50.0)	38 (92.7)	17 (58.6)	15 (100)	22 (55.0)	39 (97.5)
Day of first meeting (median, IQR)	3.0 (1.0-6.0)	1.0 (1.0-2.0)	7.0 (5.5-11.0)	2.0 (2.0-6.0)	5.0 (2.0-15.3)	1.0 (1.0-2.0)
ICU Procedures						
Cardiopulmonary Resuscitation in ICU (%)	4 (9.1)	4 (9.8)	5 (17.2)	0 (0.0)	5 (12.5)	2 (5.0)
Vasopressor (%)	21 (48.8)	28 (68.3)	17 (58.6)	7 (46.7)	24 (60.0)	15 (37.5)
Days of Vasopressor (median, IQR)	5.0 (3.0-8.0)	4.0 (2.0-5.0)	6.0 (3.0-9.0)	6.0 (4.0-10.0)	7.5 (4.0-15.0)	6.0 (4.8-8.3)
Non-invasive Ventilation (%)	4 (9.5)	3 (7.3)	6 (20.7)	2 (13.3)	7 (17.5)	8 (20.0)
Mechanical Ventilation (%)	41 (93.2)	27 (65.9)	24 (82.8)	12 (80.0)	32 (80.0)	31 (77.5)
Days of Mechanical Ventilation (median, IQR)	6.0 (4.0-13.0)	5.0 (4.0-8.0)	9.0 (6.3-12.5)	7.0 (5.3-12.0)	14.5 (6.5-28.5)	8.0 (6.0-15.0)
Renal Replacement Therapy (%)	9 (20.5)	9 (22.0)	13 (44.8)	4 (26.7)	12 (30.0)	6 (15.0)
Thoracentesis (%)	3 (6.8)	1 (2.4)	1 (3.4)	2 (13.3)	1 (2.5)	0 (0.0)
Paracentesis (%)	2 (4.5)	1 (2.4)	3 (10.3)	2 (13.3)	4 (10.0)	1 (2.5)
Lumbar Puncture (%)	1 (2.3)	0 (0.0)	1 (3.4)	0 (0.0)	3 (7.5)	0 (0.0)
GI Endoscopy (%)	3 (6.8)	1 (2.4)	3 (10.3)	1 (6.7)	3 (7.5)	5 (12.5)
Bronchoscopy (%)	6 (13.6)	2 (4.9)	5 (17.2)	2 (13.3)	17 (42.5)	6 (15.0)
Central Venous Catheter (%)	26 (59.1)	12 (29.3)	23 (79.3)	7 (46.7)	32 (80.0)	19 (47.5)
ICU Mortality (%)	17 (38.6)	15 (36.6)	14 (48.3)	7 (46.7)	20 (50.0)	17 (42.5)
Hospital Disposition						
Died	22 (50.0)	23 (56.1)	19 (65.5)	11 (73.3)	25 (62.5)	22 (55.0)
Hospice	6 (13.6)	7 (17.1)	2 (6.9)	0 (0.0)	2 (5.0)	4 (10.0)
Skilled Nursing Facility	13 (29.5)	9 (22.0)	7 (24.0)	4 (26.7)	10 (25.0)	5 (12.5)
Home	3 (6.8)	2 (4.9)	1 (3.4)	0 (0.0)	3 (7.5)	9 (22.5)

eTable 4. Interrupted Time Series Analysis of Intensive Care Unit Length of Stay

Parameter	Parameter Estimate	95% Confidence Interval	P-value
Unadjusted Model			
Study group (level change in ICU LOS, days)	-3.298	(-6.518, -0.079)	0.045
Time (slope of overall secular trend)	-0.001	(-0.068, 0.067)	0.994
Time after intervention (slope change)	0.024	(-0.086, 0.134)	0.808
Adjusted Model*			
Study group (level change in ICU LOS, days)	-3.720	(-7.280, -0.161)	0.041
Time (slope of overall secular trend)	0.008	(-0.064, 0.081)	0.821
Time after intervention (slope change)	0.011	(-0.106, 0.129)	0.849

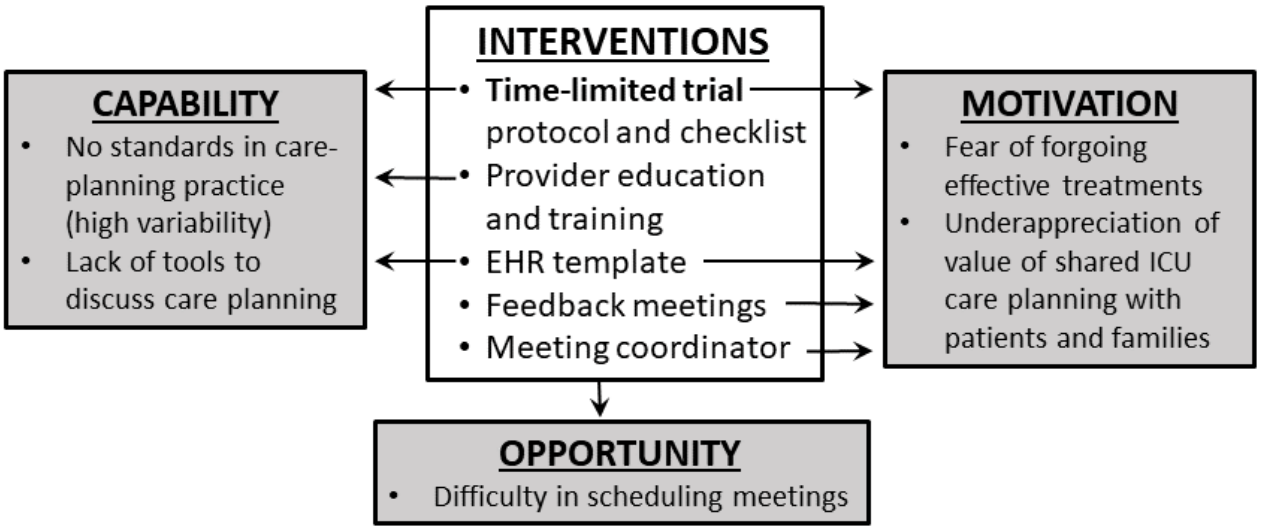
*Adjusted for age, Charlson index, APACHE II score, ICU diagnosis, and hospital

eFigure 1. Study Flowchart for Conducting Family Meetings and Implementing Time-Limited Trials



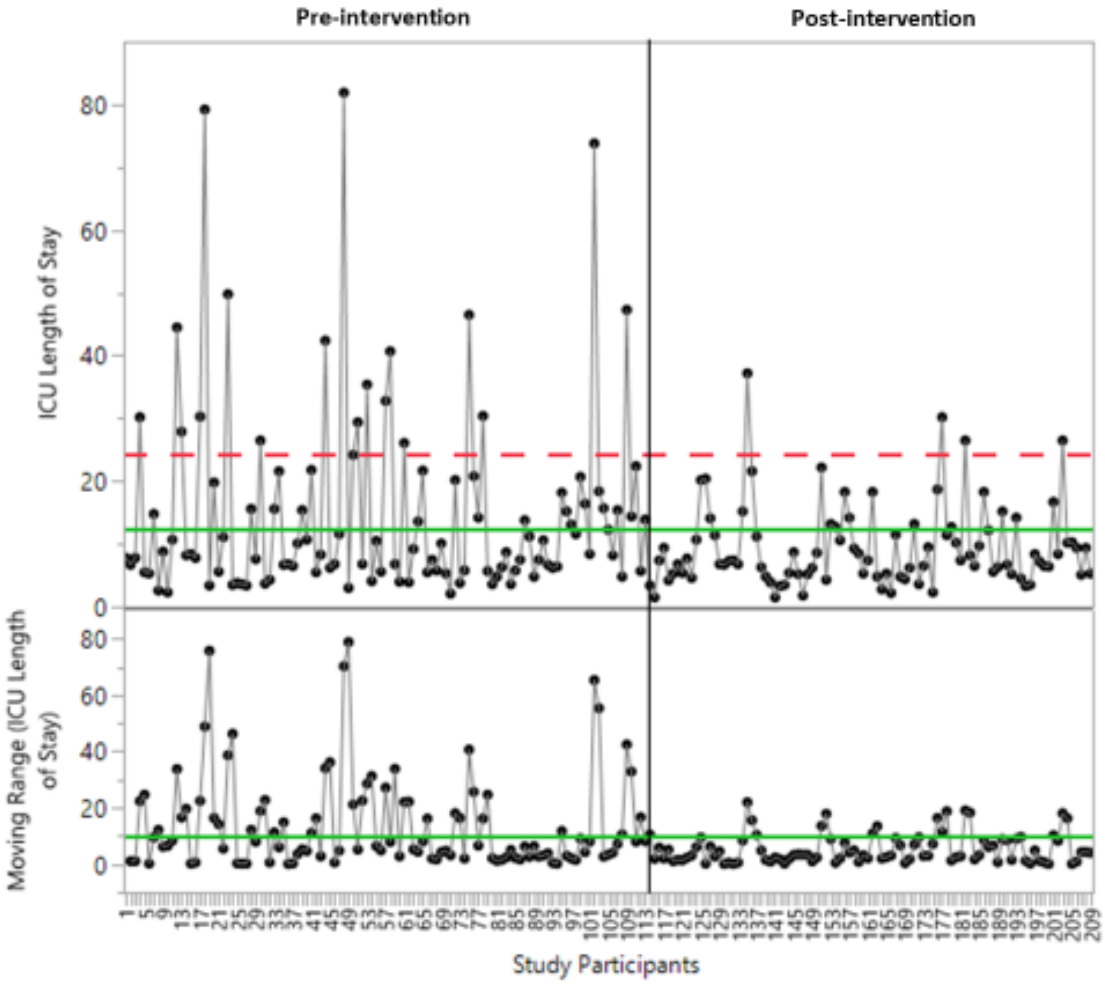
eFigure 2. Conceptual Framework for Study Interventions

The Capability, Opportunity, Motivation Behavior (COM-B) Framework was used to address barriers to effective communication and care-planning with patients and families. Interventions addressed key barriers to the capabilities, opportunities and motivation of ICU physicians to perform high quality family meetings.



eFigure 3. Shewhart Control Chart of Intensive Care Unit Length of Stay by Individual Patients in Preintervention and Postintervention Periods

(upper panel=mean days, lower panel=moving range) by individual patients (chronologically enrolled into study) in pre- and post-intervention periods. The green line represents the overall group average. The red line represents the upper boundary for 2 standard deviations. The variability in ICU length of stay and number of patients with prolonged ICU hospitalizations is reduced in the post-intervention period.



eFigure 4. Cumulative Distribution Curves for Patients in the Preintervention and Postintervention Periods

Cumulative distribution curves for patients in the pre-intervention (red) and post-intervention (blue) periods. The proportion of patients with ICU hospitalizations 7 days or less were similar. The curves then diverge and a greater proportion of patients in the post-intervention period had shorter ICU hospitalizations (p=0.03, Kolmogorov–Smirnov test).